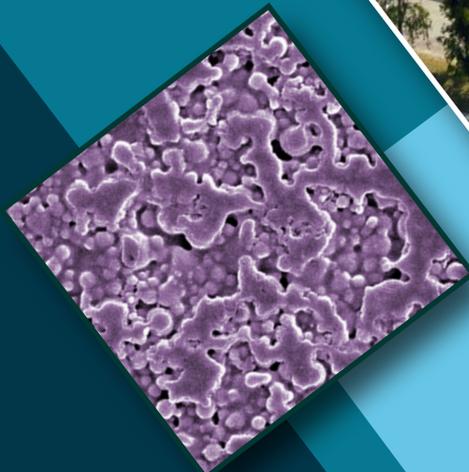


# BUSINESS OPPORTUNITIES

## Safe-On Technology: A iodine-based antimicrobial coating

An antimicrobial coating capable of adsorbing high amounts of iodine, allowing its subsequent long-term controlled and sustained release.



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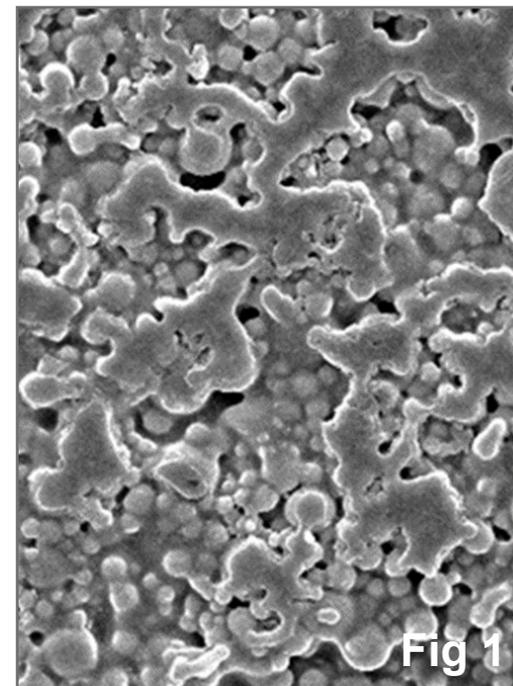
## APPLICATION LANDSCAPE AND NEED

Over the recent past, antimicrobial coatings have gained traction in the medical & healthcare sector across the globe. This is mainly attributed to the growing awareness and government initiatives to prevent the spread of Healthcare Associated Infections (HAIs), especially during COVID-19 pandemic. These HAIs are directly or indirectly related to the use of medical devices during treatments procedures, such as when these tools are inserted into the body.

Several medical devices provide a breeding ground for bacteria and their growth and it is nearly impossible to clean or disinfect them with conventional antibiotics.

As a precautionary measure, several medical device manufacturers and healthcare facilities have started applying antimicrobial coatings on the products as a simple prophylactic strategy, as they prevent microorganisms from attaching and growing on surfaces.

Among the most efficient topical biocides is iodine, which is widely available, inexpensive and has broad-spectrum antimicrobial activity, with no tendency to form resistances. However, iodine has many drawbacks (such as low solubility in water and difficult manipulation due to toxicity). Nowadays, there is a need to provide effective iodine-based antimicrobial materials that can be used in dry applications, such as in antimicrobial coatings or films.



## INNOVATION

The Catalan Institute of Nanoscience and Nanotechnology (ICN2) has developed the Safe-On Technology, an innovative coating with antimicrobial activity based on iodine adsorption and storage in a metal-organic framework (MOF) material.

The Safe-On Coating Technology is prepared by adsorbing iodine into microporous spherical microbeads of a MOF material. These microbeads are porous superstructures of agglomerated MOF crystals conveniently synthesized by continuous-flow-spray-drying. They adsorb and store iodine at very high concentrations (the iodine-adsorbed microbeads are hereafter referred to as I2@MOF). I2@MOF is incorporated into a biocompatible polyurethane polymer which, being non-porous and impermeable, acts as a sealant (See Figure 1) that avoids fast release of iodine while still enabling controlled emission through diffusion.

The Safe-On Coating allows the release of low concentrations of iodine in a controlled and sustained manner during long-time, resulting in long-term efficient antimicrobial activity. Should the need arise, light-induced liberation of high quantities of iodine can be implemented by incorporating photothermal nanoparticles within the MOF.

## APPLICATIONS

- ▶ Medical and healthcare segment: medical devices and equipment, hospital surfaces, filters comprising a composite, a polymer blend or a coating material.
- ▶ Food and beverage.
- ▶ Building and construction, to ensure the safety and hygiene of the workplaces.
- ▶ HVAC system.
- ▶ Protective clothing.
- ▶ Transportation.
- ▶ Others: consumer electronics, appliances, and packaging.

## KEY ADVANTAGES

Safe-On Technology provides the possibility of using iodine as an antimicrobial agent in dry applications:

- ▶ High iodine adsorption and storage capacity.
- ▶ High antimicrobial spectrum.
- ▶ Long-term controlled and sustained iodine release.
- ▶ Scale-up preparation method (continuous-flow-spray-drying).
- ▶ Suitable for dry applications.
- ▶ Low-cost biocide.

# STAGE OF DEVELOPMENT

The Safe-On Technology is at the laboratory validation stage. We have designed a scalable, continuous-flow, spray-drying methodology, enabling facile synthesis of microporous microbeads of MOFs. The microbeads can adsorb and store iodine at concentrations of up to 0.9 mg I<sub>2</sub> mg<sup>-1</sup> MOF. These iodine-adsorbed microbeads have been incorporated at different concentrations into a biocompatible polyurethane polymer to produce iodine-based antibacterial films. The resulting films have shown effortless adhesion to surfaces, demonstrating their suitability for use as coatings. The release of iodine from the films have been found to occur in a controlled and sustained manner over a long time by diffusion. The antibacterial performance of these films has been confirmed against gram-positive and gram-negative bacteria, viruses, and fungi (See Figure 3).

# BUSINESS OPPORTUNITY

The ICN2 is looking for industrial partners interested in licensing the technology and/or collaborating on testing Safe-On Technology antimicrobial activity against bacteria, viruses, and fungi in healthcare systems.

**INTELLECTUAL PROPERTY:** European patent application filed in September 2021.



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